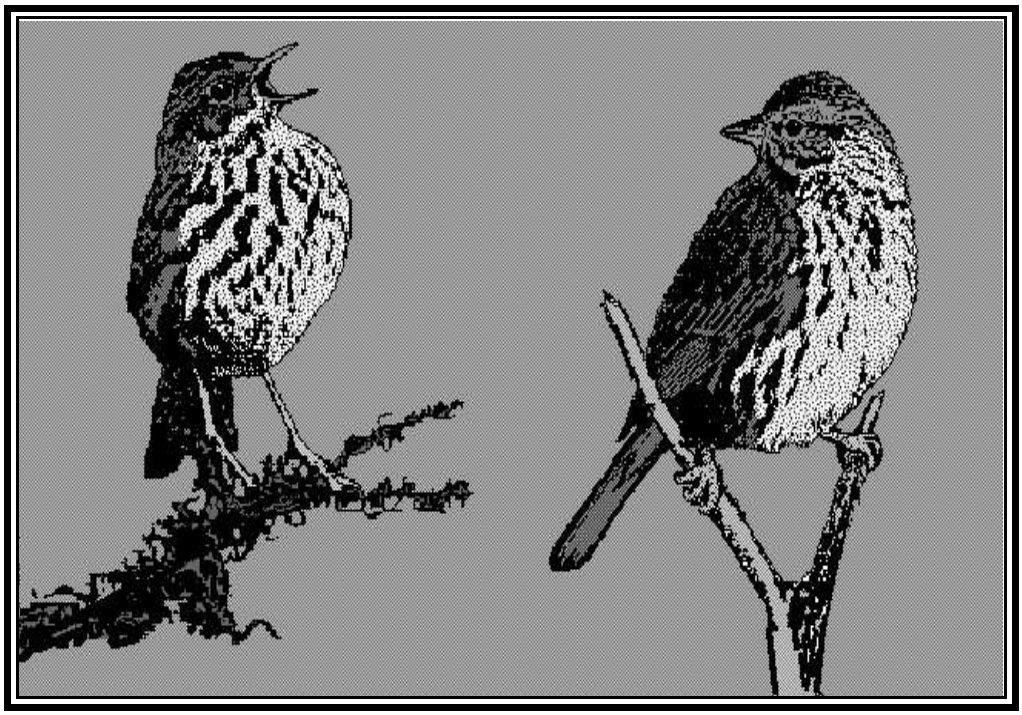

1998 Survey for the Belding's Savannah Sparrow (*Passerculus sandwichensis beldingi*) at the Bolsa Chica Wetlands, Orange County, California

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Summary
A total of 229 Belding's savannah sparrow (*Passerculus sandwichensis beldingi*) territories was observed during a two-morning survey of the potential habitat at the Bolsa Chica Wetlands in April, 1998. Comparisons are also made to 11 previous years of annual surveys to determine areas of consistently high and low abundance of Belding's savannah sparrows.

Introduction

The Belding's savannah sparrow (*Passerculus sandwichensis beldingi*), hereafter "Belding's," is one of four subspecies of savannah sparrows that is otherwise widely distributed and occur in a variety of habitat types, including grassland, high-elevation meadow, and marshes (AOU 1983; James and Stadtlander 1991). The Belding's savannah sparrow is unique in that it represents one of only two wetland-dependant avian species endemic to coastal salt marshes in southern California (Powell and Collier 1998). This species is a year-round resident of these salt marshes, and is therefore reliant upon these habitats to meet all of its life history requirements. This race ranges along the southern California coast from Santa Barbara County (Goleta Slough) in the north into Baja California, Mexico (near El Rosario) in the south (James and Stadtlander 1991).

The Belding's savannah sparrow is a small brown sparrow with fine streaking on the head and face, a pale beige to white belly, and often shows a dark central breast spot. As with most ground dwelling species, this bird is inconspicuous and blends well with its environment. The most distinguishing characteristic is the yellowish color of the lores (area between the bill and eyes) (Massey 1979).

The main factors that influence the long-term survivability of this subspecies are the health and security of its habitat. In southern California, the long-term protection of coastal salt marsh habitat is closely tied to ownership and use of the land. More than half of the salt marsh habitat that occurs in southern California is in private ownership and development proposals exist for several of these marshes. Other threats include problems associated with human trespassing, pets within the marshes, encroachment from adjacent human activities, and habitat degradation (Zembal *et al.* 1988).

This subspecies was listed as endangered by the State of California in 1974 due to the development, degradation, and fragmentation of coastal salt marsh habitat as numbers of Belding's savannah sparrows were observed to decrease dramatically (Zembal *et al*. 1988). Since listing, many research studies have been completed on this species, including a life history study (Massey 1979), studies on habitat requirements (USFWS 1986, Johnson 1987, Powell 1993), research on the effects of habitat loss and fragmentation (Powell and Collier 1998), and various localized (e.g., Zembal 1986, Kus 1990) and rangewide surveys (e.g., Bradley 1973, Zembal *et al.* 1988, James and Stadtlander 1991).

Because of the secretive nature of this sparrow, it can be difficult to obtain accurate population estimates. Given the right habitat conditions, territory size may be small and breeding pairs may occur in relatively high concentrations (Zembal *et al.* 1988). Census techniques consist of searching for territorial males in suitable habitat during the breeding season (late March through early July). Territorial behavior is ascertained through detection or observation of singing, scolding, aerial chases, nest-building, feeding young, or extended perching of individuals or presumed mates perching together in an area.

The Bolsa Chica wetlands area now totals about 1,300 acres located in the City of Huntington Beach, Orange County, California, Figure 1. Historically, Bolsa Chica was a salt marsh ecosystem under the full influence of the ocean tides. Modern day activities have diminished its area, reduced or eliminated tidal influence, and physically modified the wetlands. The Bolsa Chica Wetland Restoration Project will restore wetland habitats at Bolsa Chica. The objective of this study was to obtain a 1998 total population count, using methodology as consistent as possible with the 11 other annual surveys at Bolsa Chica. These data will also help to provide baseline information for planned future wetland restoration activities at Bolsa Chica.

Methods

Surveys were conducted on mornings from April 22 to 24, 1998 by Annie Hoecker, Bob James, Kathy Linder, and Will Miller, all biologists with the Carlsbad Fish and Wildlife Office of the Fish and Wildlife Service, following methodology described in Zembal *et al.* (1988). Due to the network of oil well pads and access roads, the area has been subdivided into cells that have been numbered and used as count areas, Figure 2. The survey technique was validated for consistency before each biologist surveyed their assigned group of cells. A total of about 21 hours was spent in the field. Surveys were conducted from 0730-1130. At the start of the surveys, air temperatures ranged from 60-65°F, with 100% cloud cover, and winds of Beaufort 0-2. Cloud cover generally cleared by 1100, with slightly increasing winds. Habitat conditions (percentage of water, percentage and type of vegetation coverage) were also individually estimated and recorded for all cells by each surveyor.

Results and Discussion

Population Survey

A total of 229 territories was observed during the 1998 survey effort, nearly identical to the 1997 total of 228 (Table 1). The overall pattern over the last 13 years has been an increase in the number of Belding's, to the plateau observed over the last four years, Figure 3. Nearly all ponds contained at least one territorial Belding's. The main exception was the area adjacent to the Wintersburg Flood Control Channel at the northerly end of the wetlands (cells 50-53).

Inner Bolsa Bay (IBB), the second largest area after Outer Bolsa Bay, and an area with a muted tidal influence, has consistently been among the highest in territory number (Tables 1, 2). Ponds 61 and 62 immediately adjacent to IBB, and cells 2 and 11 have also consistently supported relatively high numbers of Belding's. Interestingly, IBB has shown a decrease over the last two years. A high of 56 territories was observed in IBB in 1989, but only 14 and 11 territories respectively for 1997 and 1998 were detected, despite healthy-appearing *Salicornia* habitat.

The year 1998 was a relatively high (El Niño) rainfall year. About 31 inches of rain was measured along the Los Angeles coastal plain, as compared to a 50-year mean of about 12 inches. Inundation of most ponds was observed as Belding's were primarily observed on the

pond fringes or berms within the cells still containing pickleweed (*Salicornia virginica* or *S. subterminalis)*. Further aggravating the problem is the apparent increased freshwater runoff from the Huntington Mesa due to adjacent housing development. Areas of *Typha*-dominated freshwater marsh and willows have recently developed along the edge of cell 11 and appear to be limiting Belding's habitat.

Areas of consistently low numbers of Belding's have included cell 5, cell 6, most of the cells southerly of Freeman Creek (21-29 & 32-38), and many of the cells adjacent to the Wintersberg Flood Control Channel or in the northerly corner (45-55). These locations generally have no direct tidal influence, have a high perimeter to area ratio due to their small cell sizes, and often contain a relatively large amount of non-native vegetation or perennially ponded water. Many of these cells were largely flooded during the time of this survey.

Non-native vegetation, primarily iceplant, and secondarily myoporum (*Myoporum* sp.), Tamarisk (*Tamarix* sp.), and non-native grasses (*Bromus* and *Avena*), are a common component of the vegetative cover of some cells. Localized control (application of Rodeo and/or physical removal) in these areas could increase the carrying capacity for Belding's in the absence of a larger restoration project by providing an opportunity for pickleweed to replace the non-native vegetation.

Habitat Conditions

The preferred nesting habitat of the Belding's savannah sparrow is the mid- to upper-littoral zones in tidally influenced systems and in pickleweed flats of nontidal salt marshes. Pickleweed, is the dominant vegetation within Bolsa Chica, with unvegetated flats/seasonal ponds being the other dominant cover type. Outer Bolsa Chica is under nearly full tidal influence while inner Bolsa Chica and cell 3 are under very muted tidal influence. Nearly all other parts of Bolsa Chica are at intertidal elevations but are not under tidal influence because of the containment dikes around inner Bolsa. Thus, some extensive areas of pickleweed at Bolsa Chica are growing at lower elevations than it would in a tidal system. Other vegetation found at Bolsa Chica includes several iceplants, saltgrass (*Distichlis spicata*), spiny rush (*Juncus acutus*), and mustard (*Brassica* sp.), as well as several weedy plant species.

Subject to rainy season ponding, the western cells (cells 1-8, excluding cell 2) that border Inner Bolsa Bay had April water levels ranging from 10 to 98 percent (average = 72.5 %). Vegetation within these western cells was composed of pickleweed, saltgrass, and iceplant. The vegetative quality within these cells was predominately characterized as good to fair. Cells located in the southwestern corner of Bolsa Chica (cells 2, 9-14) experienced higher levels of flooding. With the exception of cell 2, the average percentage of water within the cells was 87.5. The high number of Belding's territories (19) within cells 10-14 may be a reflection of the high quality pickleweed recorded within those cells.

Extensive flooding was also evident in the southeastern section of Bolsa Chica (cells 19-37). Over 50% of the cells in this section had water levels at 80% or higher. The percentage of

vegetation with this area ranged from 5 to 50 percent, with an average of 23 percent. The condition of the vegetation was characterized as fair and the dominant plant species included pickleweed, iceplant, and myoporum. Smaller cells composed the majority of this section, each supporting one territory. Because Belding's are niche specialists, available habitat appears to be the limiting factor in the density of birds in this section.

The eastern side of Bolsa Chica (cells 38-50, excluding cells 43-44) supported more vegetation. Cell 41 was covered with 40% vegetation supporting seven Belding's territories. Overall, the vegetation in this section was characterized as fair to poor, possibly explaining the absence of Belding's in several areas.

Within the middle portion of Bolsa Chica (cells 15-18, 43, 44) vegetation covered an average of 35% of the cells. Fair to good habitat supported a total of 42 territories in 6 cells. Non-native vegetation was abundant within the cells, perhaps contributing to the concentration of birds in smaller patches of suitable habitat. For example, 10 Belding's territories were recorded in the middle portion of cell 44.

Conclusion

Given previous reports, and our observations, it appears that prolonged inundation can negatively affect Belding's by making less pickleweed habitat available for use either by inundating it or by causing its elimination by drowning. Saturated soil or shallow ponding beneath pickleweed may improve the nesting environment for Belding's. Although depressed in recent years, the Belding's population in Inner Bolsa Chica has averaged the highest, followed by cells 61, 62, 2, 11, 1, and 59. IBC is under a muted tidal regime, while the others have some extent of perennial pond present, suggesting they are nearly always "wetter" than other areas with similar extent of pickleweed. Some very extensive areas of pickleweed at Bolsa Chica averaged far fewer Belding's, e.g. cells 41-50, although some of these cells have been supporting many more pairs in recent years than before.

With 229 pairs/territories in 1998, the Belding's population at Bolsa Chica remained near the average of the last 4 years (239 pairs, 1995-1998). The average population at Bolsa Chica from 1986 through 1994 was 143 pairs. It remains unclear why the Belding's population at Bolsa Chica jumped up about 40 percent (96 pairs) in 1995 (177 in 1994 to 251 in 1995) and has remained relatively even since that time. The removal of the non-native red fox from this system may have allowed reduced predation on ground nesting birds.

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Table 1. Bolsa Chica Wetlands, Belding's Savannah Sparrow Breeding Pairs, 1986-1989, 1991-1998

Cell	1986	1987	1988	1989	1991	1992	1993	1994	1995	1996	1997	1998	12-yr mean
1	10	4	6	8	12	18	19	8	26	25	5	13	13
2,11	13	6	27	14	7	14	17	17	19	19	12	7	14
3	-	2	3	3	2	7	8	7	13	9	5	14	6
4	3	1	4	4	7	6	3	2	4	5	8	8	5
5	0	0	0	2	0	0	1	1	2	1	0	0	1
6	0	1	0	1	0	1	0	3	3	1	5	4	2
7	3	2	1	2	6	5	2	11	8	6	14	4	5
8	1	0	3	4	6	5	2	6	6	8	11	10	5
9	1	1	0	1	8	3	3	1	2	1	1	5	2
10	2	1	2	1	3	3	2	3	2	4	6	5	3
12	0	0	0	0	2	0	0	1	2	6	7	6	2
13	0	1	0	0	1	0	0	0	2	0	1	4	1
14	0	0	1	2	1	0	2	3	1	4	5	7	2
15	0	1	3	3	1	4	4	5	4	5	6	7	4
16	3	1	1	2	0	1	6	2	6	3	1	5	3
17	5	4	2	9	1	1	2	2	4	4	1	6	3
18	6	1	2	0	1	4	7	12	7	8	4	8	5
19, 20	3	5	2	4	0	5	4	6	9	8	8	4	5
21-29	1	0	0	0	1	0	0	2	2	3	3	9	2
30,31	10	10	2	2	2	2	4	8	5	5	4	7	5
32	0	0	0	3	1	1	1	1	4	2	0	2	1
33	0	0	0	0	0	1	1	1	0	1	4	4	1
34-37	2	2	2	0	0	0	1	2	2	4	3	3	2
38	2	0	1	1	0	1	0	0	0	1	0	1	1
39,40	7	0	1	0	0	4	0	3	6	6	9	8	4
41,42	8	0	4	2	3	2	0	0	6	14	22	16	6
43,44	6	0	6	3	4	5	7	5	17	13	16	17	8
45,46	4	0	3	0	0	0	0	0	1	2	6	7	2
47-54	0	0	0	0	1	0	0	0	0	0	5	1	1
55,67	0	2	0	0	1	4	2	6	12	5	0	2	3
58-60	18	17	15	6	0	9	13	5	15	9	15	9	11
61,62	24	8	2	9	7	20	25	24	23	24	27	14	17
IBC	29	25	38	56	32	31	20	29	36	35	14	11	30
OBC	2	1	5	2	1	2	5	1	2	8	0	1	3
Totals	**163**	**96**	**136**	**144**	**111**	**159**	**161**	**177**	**251**	**249**	**228**	**229**	**175**

Sources: U.S. Fish & Wildlife Service 1986-1988, 1991, 1997, 1998; California Department of Fish and Game 1989; Guthrie *et al.* 1992-1996.

Table 2. Bolsa Chica Wetlands, Belding's Savannah Sparrow Breeding Pairs, 1986-1989, 1991-1998. The Listing is Ordered by Ranking by Highest Number of Belding's.

Cell	1986	1987	1988	1989	1991	1992	1993	1994	1995	1996	1997	1998	12-yr mean
IBC	29	25	38	56	32	31	20	29	36	35	14	11	30
61,62	24	8	2	9	7	20	25	24	23	24	27	14	17
2,11	13	6	27	14	7	14	17	17	19	19	12	7	14
1	10	4	6	8	12	18	19	8	26	25	5	13	13
58-60	18	17	15	6	0	9	13	5	15	9	15	9	11
43,44	6	0	6	3	4	5	7	5	17	13	16	17	8
41,42	8	0	4	2	3	2	0	0	6	14	22	16	6
3	-	2	3	3	2	7	8	7	13	9	5	14	6
7	3	2	1	2	6	5	2	11	8	6	14	4	5
8	1	0	3	4	6	5	2	6	6	8	11	10	5
30,31	10	10	2	2	2	2	4	8	5	5	4	7	5
18	6	1	2	0	1	4	7	12	7	8	4	8	5
19,20	3	5	2	4	0	5	4	6	9	8	8	4	5
4	3	1	4	4	7	6	3	2	4	5	8	8	5
39,40	7	0	1	0	0	4	0	3	6	6	9	8	4
15	0	1	3	3	1	4	4	5	4	5	6	7	4
17	5	4	2	9	1	1	2	2	4	4	1	6	3
10	2	1	2	1	3	3	2	3	2	4	6	5	3
55,67	0	2	0	0	1	4	2	6	12	5	0	2	3
16	3	1	1	2	0	1	6	2	6	3	1	5	3
OBC	2	1	5	2	1	2	5	1	2	8	0	1	3
9	1	1	0	1	8	3	3	1	2	1	1	5	2
14	0	0	1	2	1	0	2	3	1	4	5	7	2
12	0	0	0	0	2	0	0	1	2	6	7	6	2
45,46	4	0	3	0	0	0	0	0	1	2	6	7	2
21-29	1	0	0	0	1	0	0	2	2	3	3	9	2
34-37	2	2	2	0	0	0	1	2	2	4	3	3	2
6	0	1	0	1	0	1	0	3	3	1	5	4	2
32	0	0	0	3	1	1	1	1	4	2	0	2	1
33	0	0	0	0	0	1	1	1	0	1	4	4	1
13	0	1	0	0	1	0	0	0	2	0	1	4	1
5	0	0	0	2	0	0	1	1	2	1	0	0	1
38	2	0	1	1	0	1	0	0	0	1	0	1	1
47-54	0	0	0	0	1	0	0	0	0	0	5	1	1
Totals	**163**	**96**	**136**	**144**	**111**	**159**	**161**	**177**	**251**	**249**	**228**	**229**	**175**

Sources: U.S. Fish & Wildlife Service 1986-1988, 1991, 1997, 1998; California Department of Fish and Game 1989; Guthrie *et al.* 1992-1996.